

Cole Steel (MW-12) TCE												
General Statistics												
Total Number of Observations					6	Number of Distinct Observations					5	
						Number of Missing Observations					0	
Minimum					8.5	Mean					13.75	
Maximum					16	Median					14.5	
SD					2.824	Std. Error of Mean					1.153	
Coefficient of Variation					0.205	Skewness					-1.603	
Note: Sample size is small (e.g., <10), if data are collected using incremental sampling methodology (ISM) approach,												
refer also to ITRC Tech Reg Guide on ISM (ITRC 2020 and ITRC 2012) for additional guidance,												
but note that ITRC may recommend the t-UCL or the Chebyshev UCL for small sample sizes (n < 7).												
The Chebyshev UCL often results in gross overestimates of the mean.												
Refer to the ProUCL 5.2 Technical Guide for a discussion of the Chebyshev UCL.												
Normal GOF Test												
Shapiro Wilk Test Statistic					0.83	Shapiro Wilk GOF Test						
1% Shapiro Wilk Critical Value					0.713	Data appear Normal at 1% Significance Level						
Lilliefors Test Statistic					0.229	Lilliefors GOF Test						
1% Lilliefors Critical Value					0.373	Data appear Normal at 1% Significance Level						
Data appear Normal at 1% Significance Level												
Note GOF tests may be unreliable for small sample sizes												
Assuming Normal Distribution												
95% Normal UCL						95% UCLs (Adjusted for Skewness)						
95% Student's-t UCL					16.07	95% Adjusted-CLT UCL (Chen-1995)					14.84	
						95% Modified-t UCL (Johnson-1978)					15.95	
Gamma GOF Test												
A-D Test Statistic					0.625	Anderson-Darling Gamma GOF Test						
5% A-D Critical Value					0.697	Detected data appear Gamma Distributed at 5% Significance Level						
K-S Test Statistic					0.254	Kolmogorov-Smirnov Gamma GOF Test						

5% K-S Critical Value				0.332	Detected data appear Gamma Distributed at 5% Significance Level						
Detected data appear Gamma Distributed at 5% Significance Level											
Note GOF tests may be unreliable for small sample sizes											
Gamma Statistics											
k hat (MLE)				23.43	k star (bias corrected MLE)					11.83	
Theta hat (MLE)				0.587	Theta star (bias corrected MLE)					1.163	
nu hat (MLE)				281.2	nu star (bias corrected)					141.9	
MLE Mean (bias corrected)					13.75	MLE Sd (bias corrected)					3.998
					Approximate Chi Square Value (0.05)					115.4	
Adjusted Level of Significance					0.0122	Adjusted Chi Square Value					106.8
Assuming Gamma Distribution											
95% Approximate Gamma UCL					16.91	95% Adjusted Gamma UCL					18.28
Lognormal GOF Test											
Shapiro Wilk Test Statistic					0.777	Shapiro Wilk Lognormal GOF Test					
10% Shapiro Wilk Critical Value					0.826	Data Not Lognormal at 10% Significance Level					
Lilliefors Test Statistic					0.276	Lilliefors Lognormal GOF Test					
10% Lilliefors Critical Value					0.298	Data appear Lognormal at 10% Significance Level					
Data appear Approximate Lognormal at 10% Significance Level											
Note GOF tests may be unreliable for small sample sizes											
Lognormal Statistics											
Minimum of Logged Data					2.14	Mean of logged Data					2.6
Maximum of Logged Data					2.773	SD of logged Data					0.239
Assuming Lognormal Distribution											
95% H-UCL					17.38	90% Chebyshev (MVUE) UCL					17.81
95% Chebyshev (MVUE) UCL					19.64	97.5% Chebyshev (MVUE) UCL					22.18
99% Chebyshev (MVUE) UCL					27.16						
Nonparametric Distribution Free UCL Statistics											

Data appear to follow a Discernible Distribution												
Nonparametric Distribution Free UCLs												
95% CLT UCL					15.65	95% BCA Bootstrap UCL					15	
95% Standard Bootstrap UCL					15.49	95% Bootstrap-t UCL					15.49	
95% Hall's Bootstrap UCL					15.04	95% Percentile Bootstrap UCL					15.33	
90% Chebyshev(Mean, Sd) UCL					17.21	95% Chebyshev(Mean, Sd) UCL					18.78	
97.5% Chebyshev(Mean, Sd) UCL					20.95	99% Chebyshev(Mean, Sd) UCL					25.22	
Suggested UCL to Use												
95% Student's-t UCL					16.07							
Recommended UCL exceeds the maximum observation												
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.												
Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.												
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.												
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positively skewed data sets.												